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DERWENT-WEEK: 199801

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TITLE: Non-rewirable electric plug for domestic
equipment - has cover with pair of projections to press fuse
clips against bottom of fuse box when cover engages
with plug base

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ABSTRACTED-PUB-NO: GB 2282713A

BASIC-ABSTRACT:

The plug includes a live pin (5), a neutral pin (6) and, optionally, an earth pin (7) extending from an outer surface of a plug base (3). A fuse box (8) is defined by a recess formed in the outer surface of the plug base (3). Terminals (5a) and (6a) of the pins (5, 6) project on an inner surface of the plug base (3). Legs (27a, 27b) of fuse clips (27, 28) extend inside the fuse box (8). One fuse clip (27) has a holding portion (31) which may be crimped to a live conductor (34) of a cable core and the other clip (28) engages the terminal (5a) of the live pin (5).

A terminal of a neutral conductor (23) of the cord may be riveted onto the terminal (6a) of the neutral pin (6) and a flange (35) of clip (28) may be riveted onto the terminal (5a) of the live pin (5). A cover (4) is placed over the plug base (3) to house the terminals (5a, 6a, 7a) and other elements on the inner surface of the plug base (3). The cover (4) is fused to the plug base (3) entirely or partly.

ABSTRACTED-PUB-NO: GB 2282713B

EQUIVALENT-ABSTRACTS:

The plug includes a live pin (5), a neutral pin (6) and, optionally, an earth pin (7) extending from an outer surface of a plug base (3). A fuse box (8) is defined by a recess formed in the outer surface of the plug base (3). Terminals (5a) and (6a) of the pins (5, 6) project on an inner surface of the plug base (3). Legs (27a, 27b) of fuse clips (27, 28) extend inside the fuse box (8). One fuse clip (27) has a holding portion (31) which may be crimped to a live conductor (34) of a cable core and the other clip (28) engages the terminal (5a) of the live pin (5).

A terminal of a neutral conductor (23) of the cord may be riveted

onto the
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placed over
the plug base (3) to house the terminals (5a, 6a, 7a) and other
elements on the
inner surface of the plug base (3). The cover (4) is fused to the
plug base
(3) entirely or partly.

CHOSEN-DRAWING: Dwg.1/16 Dwg.1

TITLE-TERMS: NON REWIRING ELECTRIC PLUG DOMESTIC EQUIPMENT COVER PAIR
PROJECT

PRESS FUSE CLIP BOTTOM FUSE BOX COVER ENGAGE PLUG BASE

DERWENT-CLASS: V04 X13

EPI-CODES: V04-D03; V04-D05; V04-D06D; V04-F; V04-M02; X13-D01B;

SECONDARY-ACC-NO:

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(51) INT CL⁶

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GB 2152301 A GB 2092836 A GB 2043031 A
GB 2004707 A GB 2003676 A GB 1604428 A
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H2G GCW GEP
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(54) Non-rewireable plug

(57) A live pin (5) , a neutral pin (6) and, optionally, an earth pin (7) extend from an outer surface of a plug base (3), and a fuse box (8) is defined by a recess formed in the outer surface of the plug base (3). Terminals (5a) and (6a) of the pins (5) and (6) project on an inner surface of the plug base (3). Legs (27a) and (27b) of fuse clips (27) and (28) extend inside the fuse box (8). One fuse clip (27) has a holding portion (31) which may be crimped to a live conductor (34) of a cable core and the other clip (28) engages the terminal (5a) of the live pin (5). A terminal of a neutral conductor (23) of the cord may be riveted onto the terminal (6a) of the neutral pin (6) and a flange (35) of clip (28) may be riveted onto the terminal (5a) of the live pin (5). A cover (4) is placed over the plug base (3) to house the terminals (5a), (6a) and (7a) and other elements on the inner surface of the plug base (3). The cover (4) is fused to the plug base (3) entirely or partly.

Connections may be made by rivetting, crimping or welding. Strain relief is provided by a bushing on the cable 2.

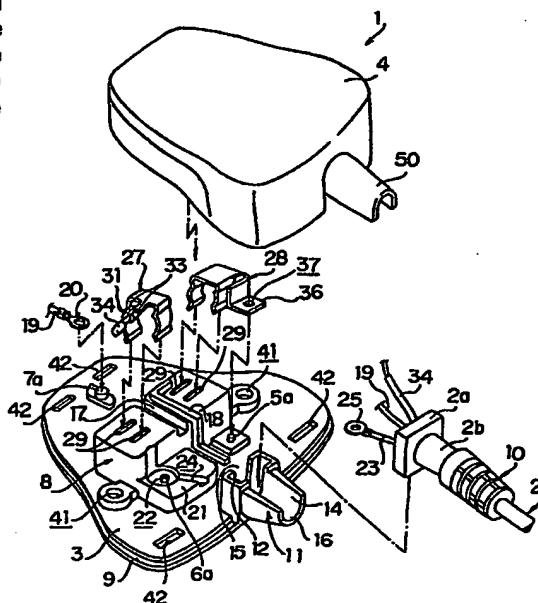


FIG. 1

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FIG. 1

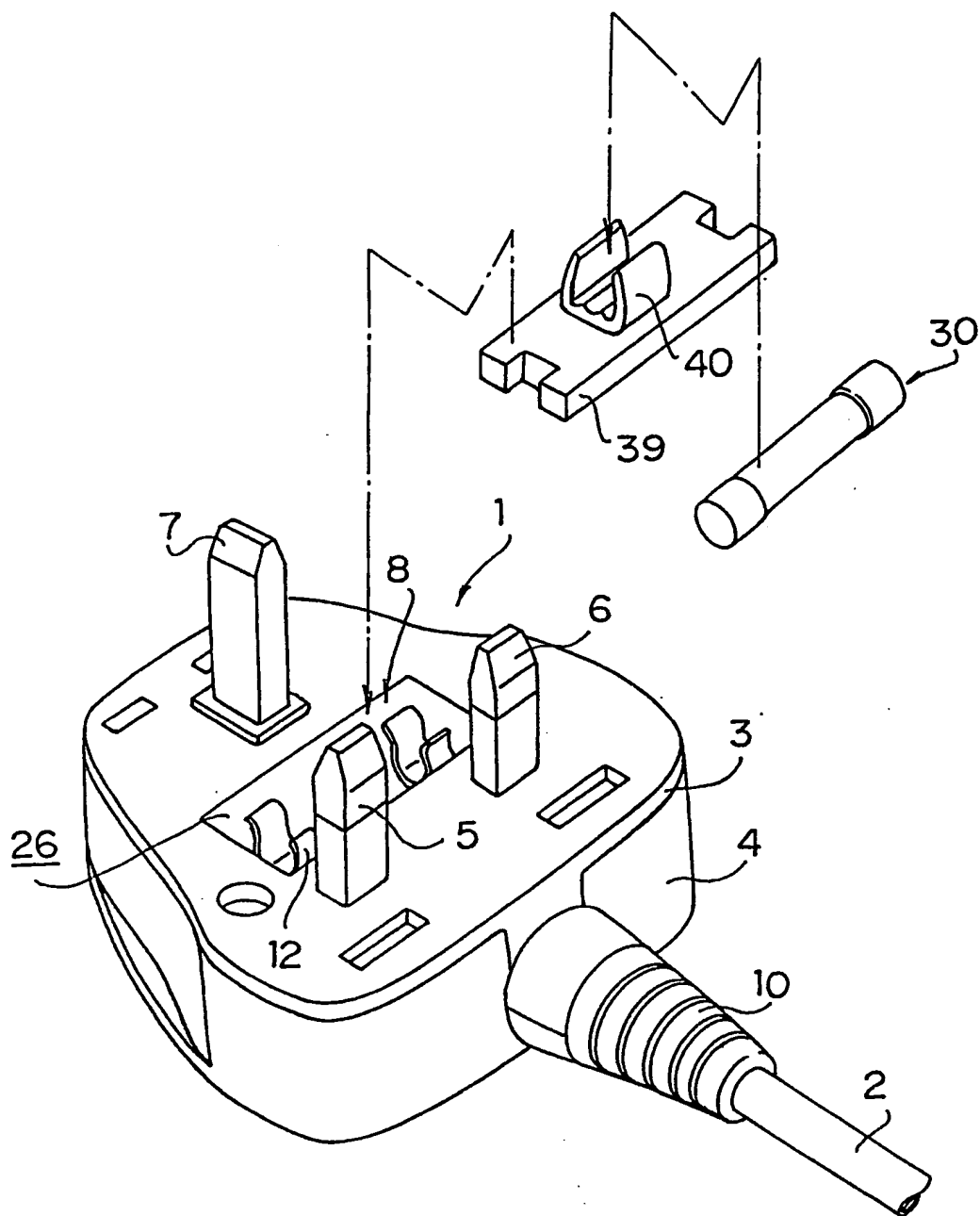


FIG. 2

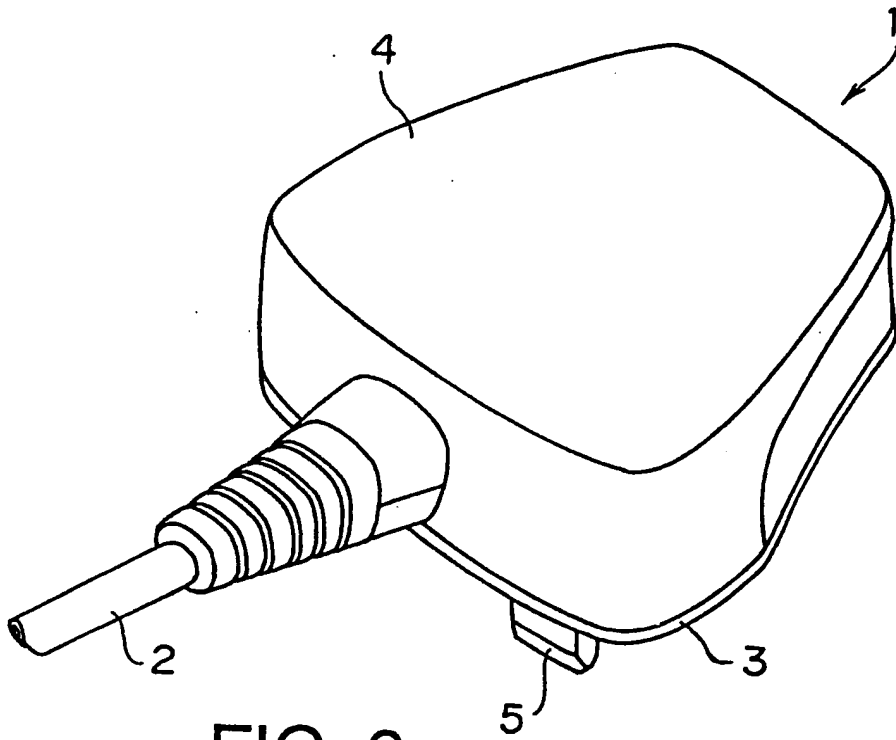


FIG. 3

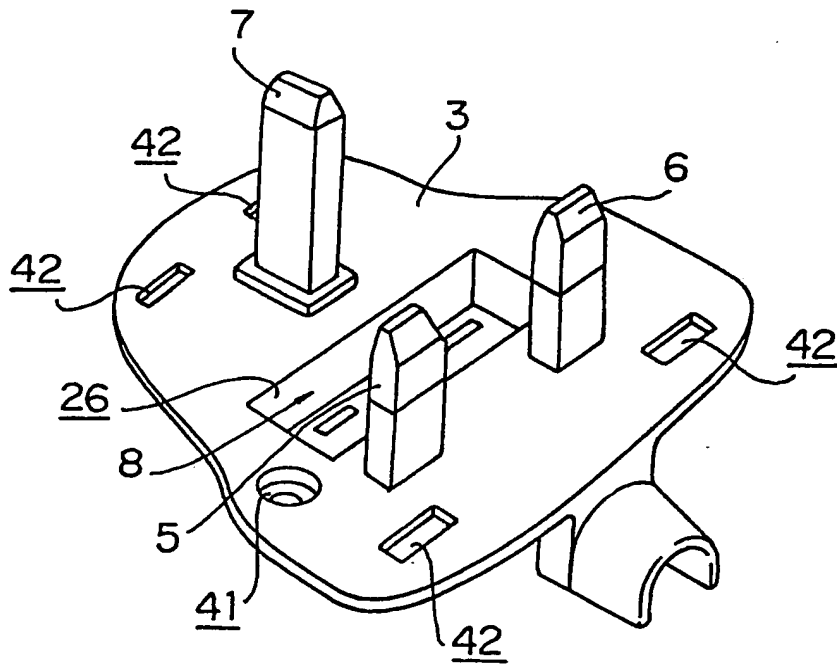


FIG. 4

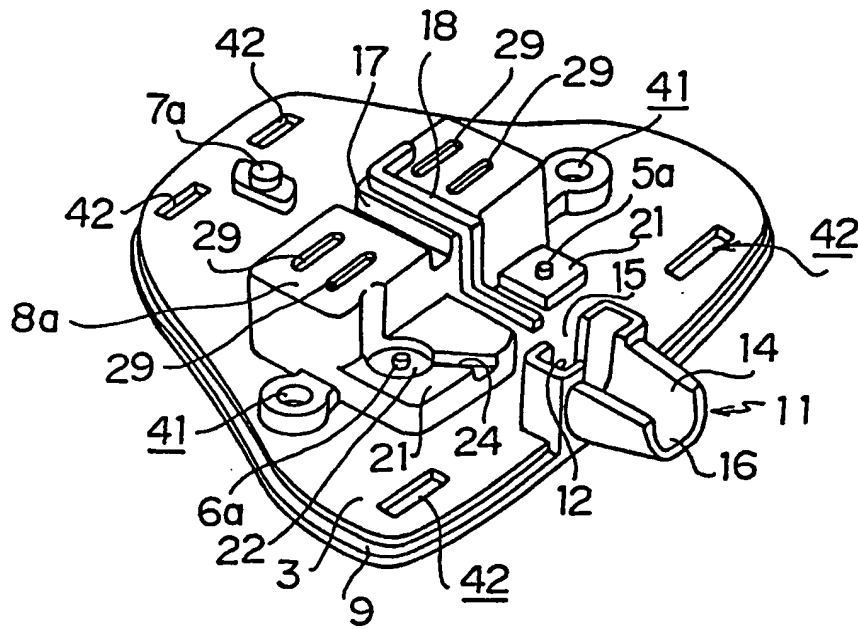


FIG. 5

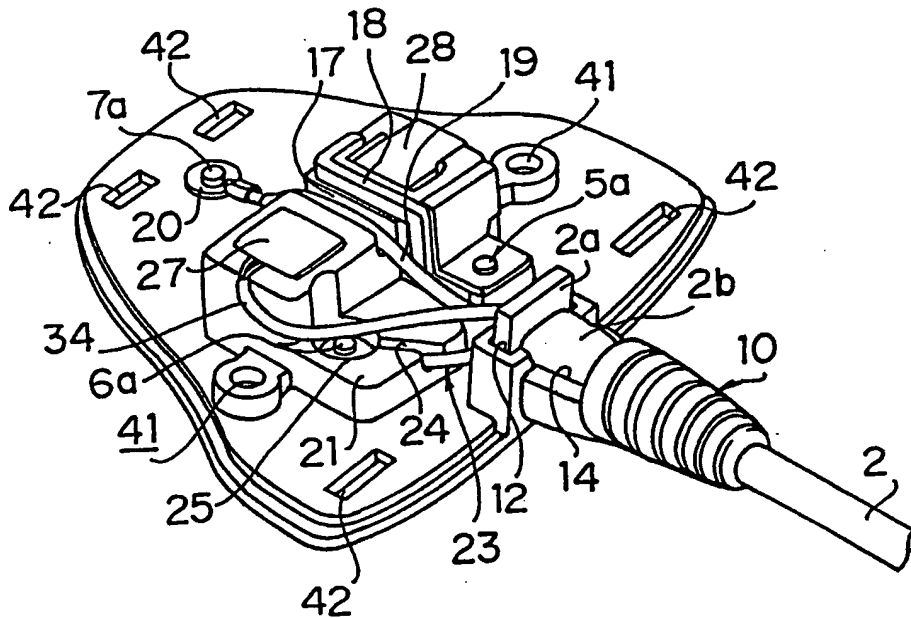


FIG. 6

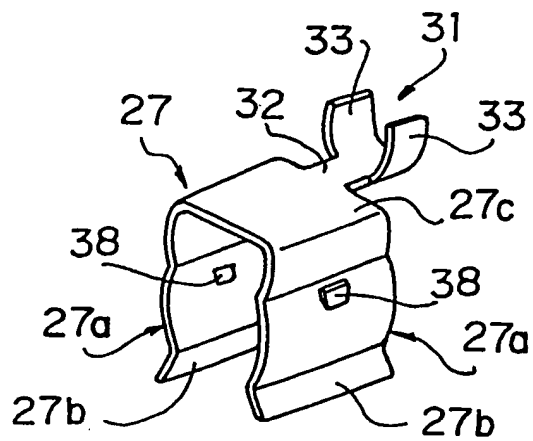


FIG. 7(a)

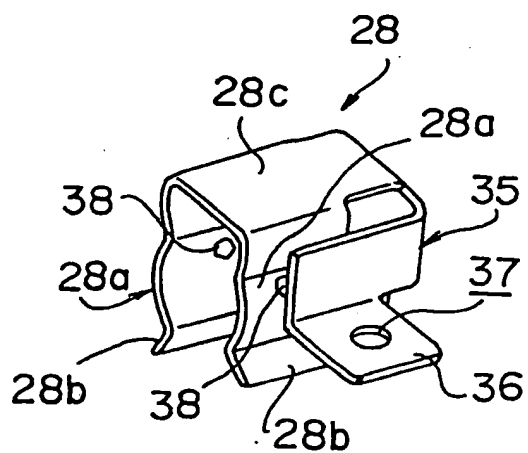


FIG. 7(b)

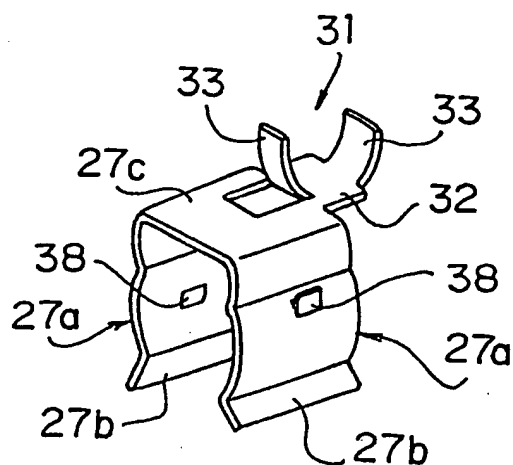


FIG. 7(c)

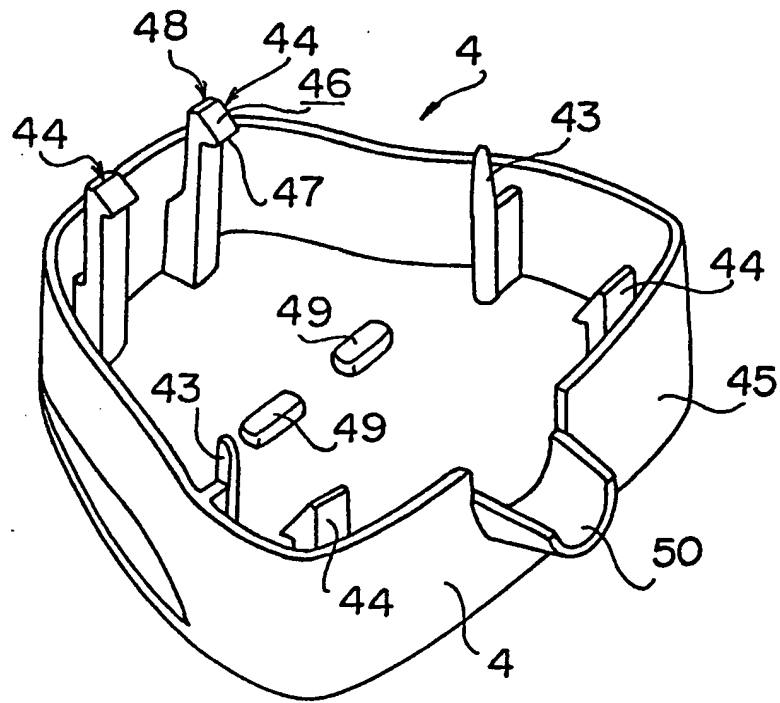


FIG. 8

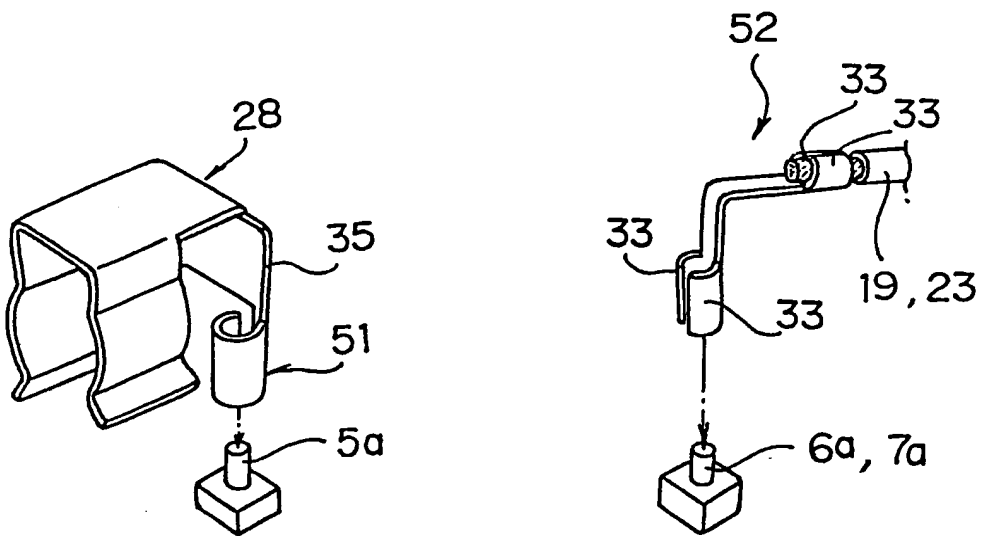


FIG. 9(a)

FIG. 9(b)

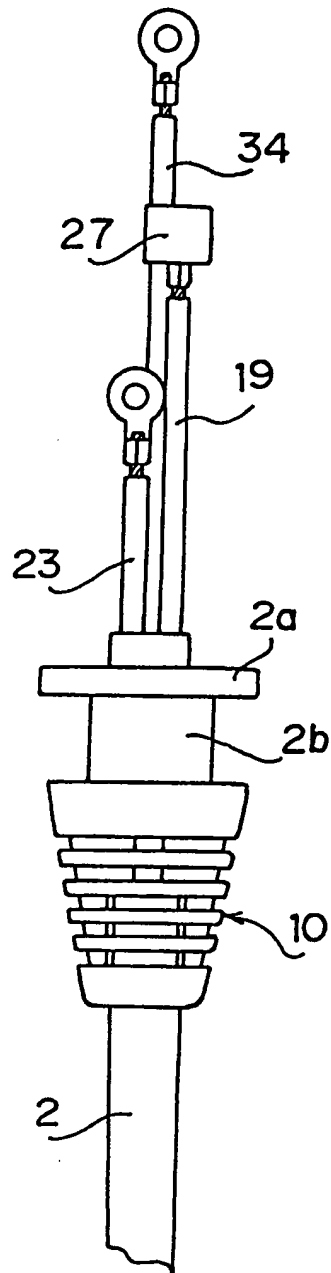


FIG. 10

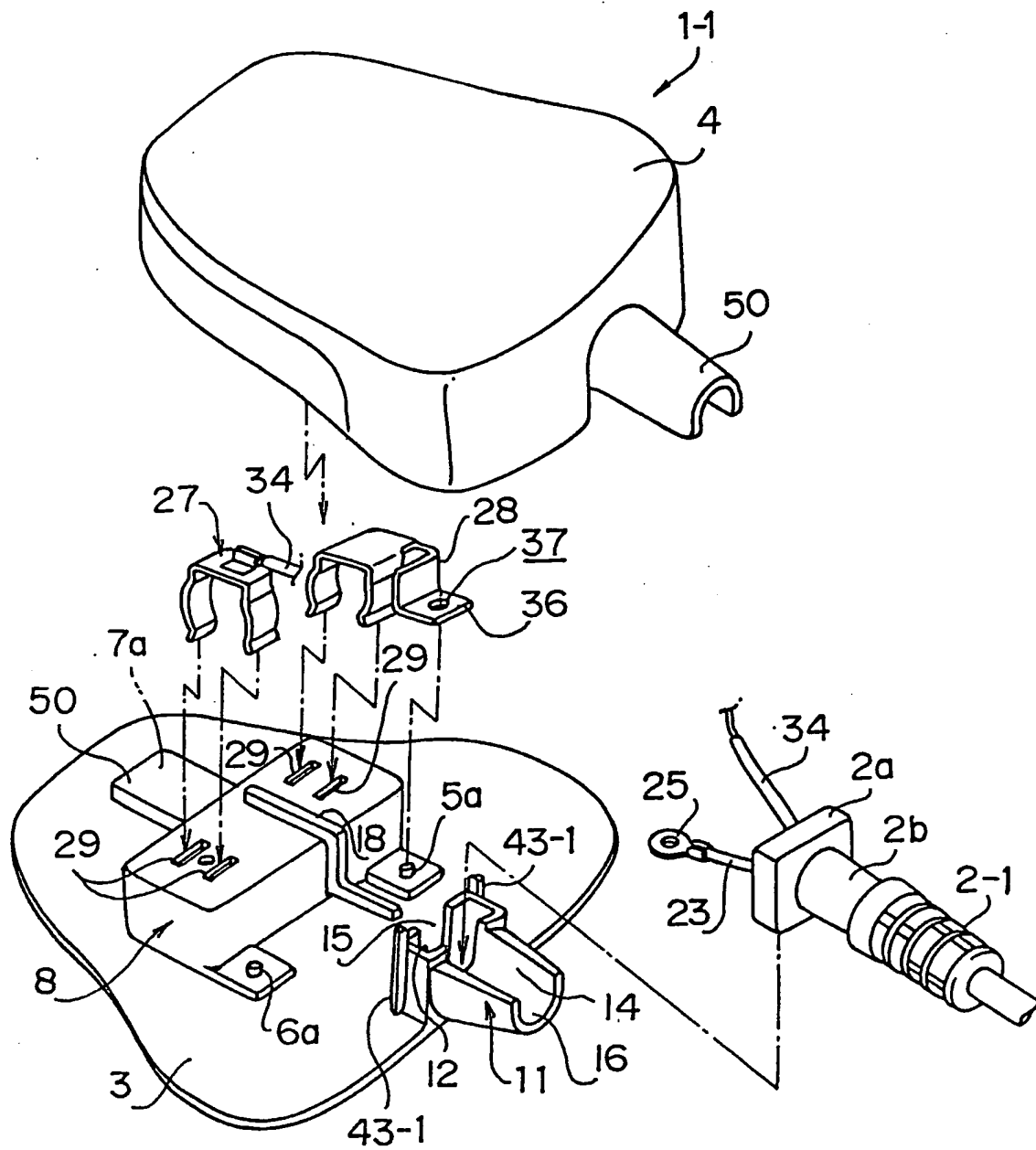


FIG. 11

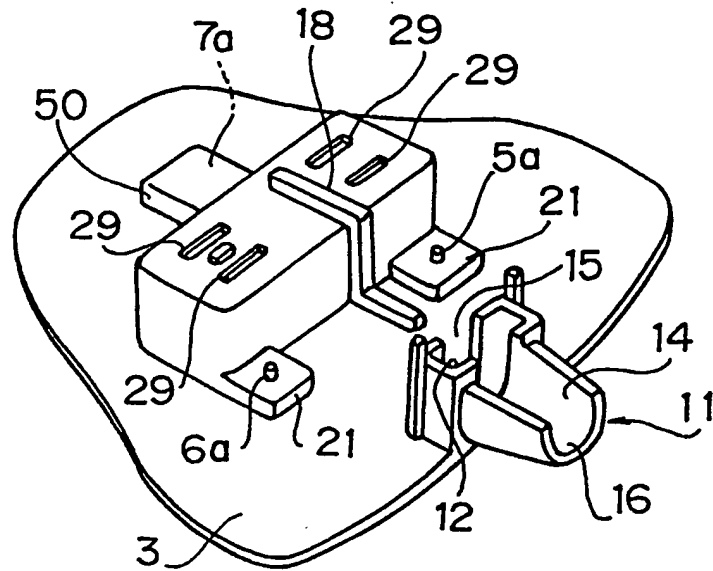


FIG. 12

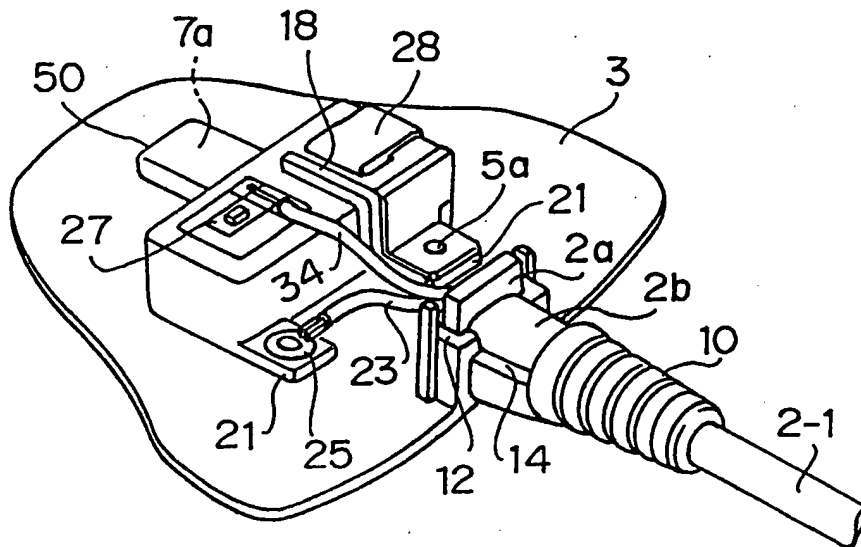


FIG. 13

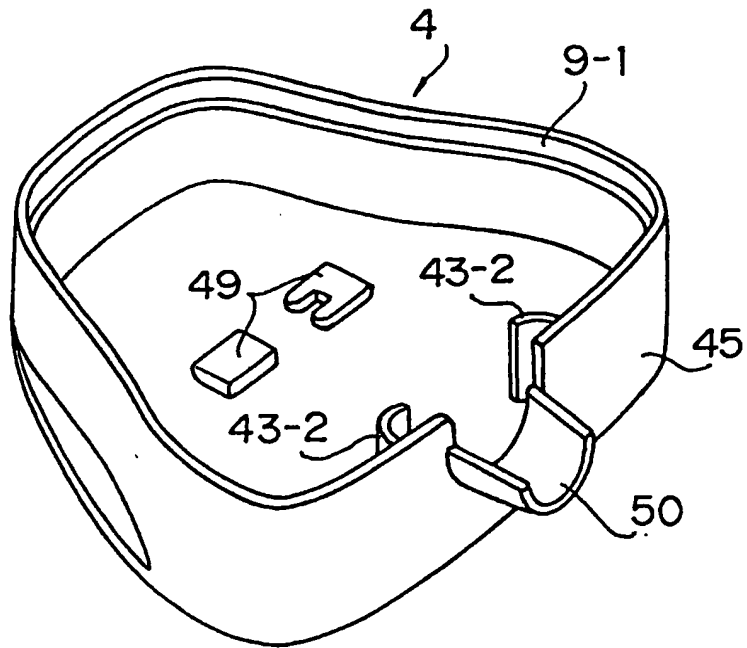


FIG. 14

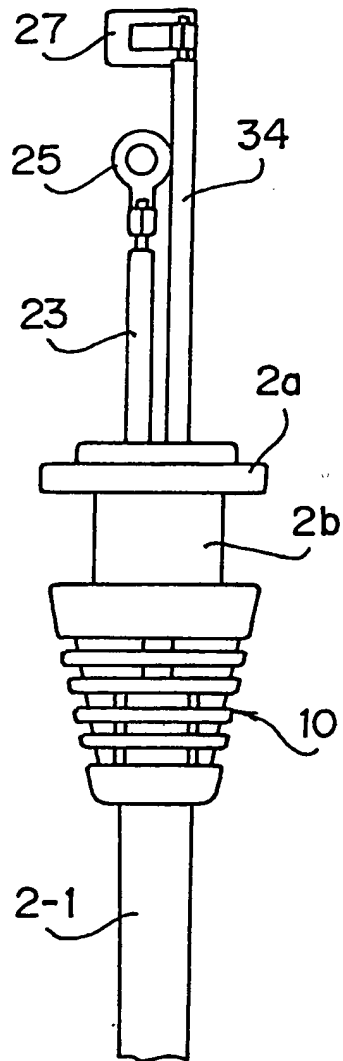


FIG. 15

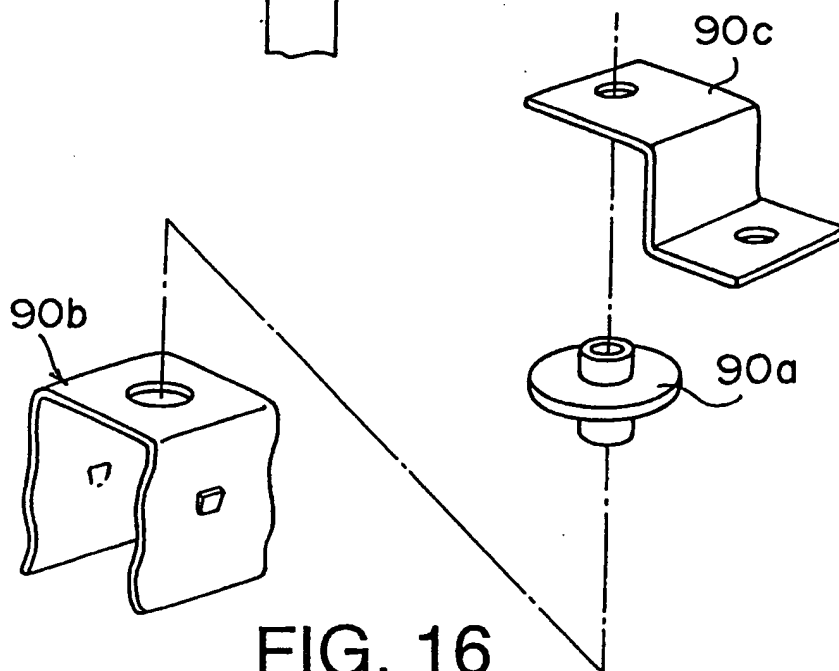


FIG. 16

POWER SUPPLY PLUGS

The present invention generally relates power supply plugs, and more particularly to an improved non-rewirable electric plug attachable, for example, to domestic-use electrical equipments and insertable into a socket.

In England and other countries, generally an electric plug attached to a domestic-use electric equipment has a three-pole structure having an earth terminal for the sake of safety.

Typically, this type of electric plug includes a plug base having three pins (an earth pin, a neutral pin and a live pin) thereon. The plug base also has a pair of fuse clips thereon. In case of three-pole structure, conventionally three conductors (an earth conductor, a neutral conductor and a live conductor) of the cord are connected with the earth pin, the neutral pin and the live pin respectively in the following manner: ring terminals are crimped at tips of the three conductors of the cord respectively (this makes three crimpings). Then, a pair of fuse clips are mounted on a plug base. Figure 16 of the accompanying drawings shows one such fuse clip 90b riveted on a plug base (not shown) with a special rivet 90a (this requires one riveting for each fuse clip). After that, a connection plate or link strap 90c connecting the fuse clip 90b with a live pin (not shown) is riveted on the plug base (two

rivetings). Further, terminals of the earth pin, the neutral pin and the live pin are riveted to the ring terminals of the three conductors of the cord, respectively (three rivetings).

However, the conventional plug has the following disadvantages: the number of the rivetings for the connection is large (ten in the above-described typical example). Thus, a manufacturing cost for the plug is raised and reliability of electrical connection is low.

An object of the present invention is to provide an electric plug which eliminates the problems of the conventional plugs and which is inexpensive and lightweight.

According to one aspect of the present invention, there is provided an electric plug to be connected with a cord having a live conductor, a neutral conductor and an earth conductor, comprising: a plate-like plug base integrally having a live pin, a neutral pin and an earth pin, the live, neutral and earth pins standing on an outside surface of the plug base respectively and having terminals projecting from an inside surface of the plug base respectively; a fuse box integrally molded to the inside surface of the plug base, the fuse box having a first pair of slit-like openings in its bottom for receiving a pair of holding portions of a first fuse clip and a second pair of slit-like openings in its bottom for receiving a pair of holding portions of a second fuse clip, the first and second fuse clips being attached onto the bottom of the fuse box from the inside surface of the plug base respectively, the first fuse clip having a portion for crimping the live conductor of the cord, the second

fuse clip having an extension, the extension having an opening for engagement with the terminal of the live pin, the neutral conductor having a ring terminal which is riveted onto the terminal of the neutral pin, the earth pin having a ring terminal which is riveted on the terminal of the earth pin, the extension of the second fuse clip being riveted onto the terminal of the live pin; and a cover engageable with the plug base along respective peripheries for enclosing an inside of the plug base, the covering being at least partially fused to the plug base.

According to another aspect of the present invention, there is provided an electric plug to be connected with a cord having a live conductor and a neutral conductor, comprising: a plate-like plug base integrally having a live pin, a neutral pin and an earth pin, the live, neutral and earth pins standing on an outside surface of the plug base respectively and the live and neutral pins having terminals projecting from an inside surface of the plug base respectively; a fuse box integrally molded to the inside surface of the plug base, the fuse box having a first pair of slit-like openings in its bottom for receiving a pair of holding portions of a first fuse clip and a second pair of slit-like openings in its bottom for receiving a pair of holding portions of a second fuse clip, the first and second fuse clips being attached onto the bottom of the fuse box from the inside surface side of the plug base respectively, the first fuse clip having a portion for crimping the live conductor of the cord, the second fuse clip having an extension, the extension having an opening for engagement with the terminal of the live pin, the neutral conductor having a ring terminal which is riveted onto

the terminal of the neutral pin, the extension of the second fuse clip being riveted onto the terminal of the live pin; and a cover engageable with the plug base along respective peripheries for enclosing an inside of the plug base, the covering being at least partially fused to the plug base.

Figure 1 illustrates a perspective exploded view of an electric plug according to the present invention;

Figure 2 is a perspective view of a front face of the plug shown in Figure 1 after assembling;

Figure 3 is a perspective view of a back face of the plug after assembling;

Figure 4 is a perspective view of a front face or outside face or engagement surface of a plug base;

Figure 5 is a perspective view of a back face or inside face of the plug base;

Figure 6 also illustrates the inside face of the plug base, with fuse clips, conductors and a three-core ring cord being mounted thereon;

Figures 7(a)-7(c) illustrate perspective views of the various fuse clips, respectively;

Figure 8 shows an interior of a plug cover;

Figures 9(a) and 9(b) show modified terminals, respectively;

Figure 10 shows the three-core ring cord;

Figure 11 depicts an exploded perspective view of an electric plug according to another embodiment of the present

invention;

Figure 12 depicts an inside face of a plug base of the plug shown in Figure 11;

Figure 13 also depicts the inside face of the plug base, with fuse clips, conductors and a two-core ring cord being mounted thereon;

Figure 14 illustrates an interior of a plug cover;

Figure 15 illustrates the two-core ring cord; and

Figure 16 is a perspective view of conventional clip, rivet and link strap.

Now, a first preferred embodiment of the present invention will be described with reference to Figures 1 to 10 of the accompanying drawings.

Referring first to Figures 1-3, an electric plug 1 includes a three-core cord 2 (this has a round shape in section), a plug base 3, a cover 4, a live pin 5 standing on the plug base 3, a neutral pin 6 standing on the plug base 3 and an earth pin 7 standing on the plug base 3. The plug base 3 and the cover 4 are one-piece elements, respectively, each being formed from an insulating material such as glass-containing polyamide, flame-retardant polybutylene terephthalate, polyphenylene oxide (PPO) and modified polyphenylene ether. The plug base 3 may be made from a modified polyphenylene ether resin. The live pin 5, the neutral pin 6 and the earth pin 7 are respectively formed from brass. These pins 5, 6 and 7 may be either solid or hollow as long as they have sufficient strength.

As illustrated in Figures 2 and 4, the plug base 3

integrally has a fuse receiving box 8 at its center. The live pin 5, the neutral pin 6 and the earth pin 7 stand around the fuse receiving recess 8. These pins 5, 6 and 7 are formed when the plug base 3 is molded so that they are integral with the plug base 3. As shown in Figures 1 and 5, bottom ends (terminals) or root portions 5a, 6a and 7a of the live pin 5, the neutral pin 6 and the earth pin 7 respectively project from an inner surface of the plug base 3. The plug base 3 has a groove 9 along its periphery for faucet joint with the cover 4. The plug base 3 also integrally has a half bushing receptacle 11 for a cord bushing 10 of the cord 2.

As depicted in Figures 1 and 6, the bushing receptacle 11 defines a first recess 12, a second recess 14, a conductor exit 15 and a conductor entrance 16. The first recess 12 is shaped to receive a square front end 2a of the bushing 10. The second recess 14 is continuous from the first recess 12 and shaped to receive a reduced portion 2b after the front end 2a. The first recess 12 is open toward the fuse box 8 and the conductor exit 15 is defined by this opening. The second recess 14 is open in a direction opposite the fuse box 8 and the conductor entrance 16 is defined by this opening.

The bushing 10 is made from a flexible PVC (low molecular polyvinyl chloride) and integrally molded with the cord 2.

Therefore, when the front end 2a and the reduced portion 2b of the bushing 10 are fitted into the first recess 12 and the second recess 14 as illustrated in Figure 6, the cord 2

is fixed to the plug 3.

As shown in Figures 1, 5 and 6, the fuse box 8 has a positioning groove 17 centrally extending in a back surface of its bottom 8a. A partition wall 18 extends over the bottom 8a of the fuse box 8 along the groove 17 on the live pin side to prevent short circuit between the fuse clip 28 and the conductor 19.

The positioning groove 17 linearly extends in this illustrated embodiment, with one end thereof being open to the terminal 7a of the earth pin 7 and the other end being open to the bushing receptacle 11. As shown in Figure 6, part of an earth conductor 19 of the cord 2 is received in the groove 17. A ring terminal 20 which is integrally crimped on a free end of the earth conductor 19 engages with the terminal 7a of the earth pin 7 and then the terminal 7a is riveted to firmly join the earth conductor 19 with the terminal 7a. Accordingly, the earth conductor 19 and the earth pin 7 are electrically connected with each other. It should be noted that the terminal 7a and the ring terminal 20 may be welded or fused to each other.

As illustrated in Figures 1 and 5, the plug base 3 has rectangular or square portions 21 to support the terminals 5a and 6a. The protrusion 21 for the terminal 6a has a ring terminal receiving area 22, which is defined by an annular recess around the terminal 6a. The same protrusion 21 also has a positioning groove 24 to receive a neutral conductor 23 of the cord 2. The positioning groove 24 is open to the ring terminal receiving area 22 at one end thereof and is open to the opening 15 of the bushing receptacle 11 at the other end.

Referring to Figure 6, the neutral conductor 23 is placed in the groove 24, and a ring terminal 25 which is firmly attached to a free end of the neutral conductor 23 by the crimping operation engages with the terminal 6a and fits in the ring terminal receiving space 22. After that, the terminal 6a is riveted to electrically connect the neutral pin 6 with the neutral conductor 23. It should be appreciated that the neutral terminal 6a and the ring terminal 25 may be welded or fused to each other.

Referring to Figures 2 and 4, the fuse box 8 has a fuse opening or open entrance 26 in the exterior surface of the plug base 3. As shown in Figures 1 and 5, the fuse box 8 also has four slit-like openings 29 in its bottom. Two of the openings 29 are used to support or guide a pair of legs (holding portions) 27a of a fuse clip 27 (Figure 7(a)) and the other two are used to support a pair of legs 28a of another fuse clip 28 (Figure 7(b)). The fuse clips 27 and 28 are attached onto the fuse box 8 from the exterior surface of the fuse box bottom, as shown in Figure 1, and their legs 27a and 28a extend or project into the fuse box 8. Figure 7(c) illustrates a modification of the fuse clip 27.

As illustrated in Figures 7(a) and 7(c), the fuse clip 27 has outwardly bent portions 27b at opposite free ends of the legs 27a for facilitating loading/unloading of a fuse 30 (Figure 2). The rounded portions 27a of the clip 27 can hold the fuse 30 due to their elasticity. The holding portions 27a are connected with each other by a connection portion 27c and the connec-

tion portion 27c has a crimping portion 31 for electrical connection with the conductor.

The crimping portion 31 includes a tongue 32 outwardly extending from the connection portion 27c and a pair of claws 33 extending from opposite sides of the tongue 32. As shown in Figure 1, by bending the claws 33 simultaneously inward using a conventional crimping device, the live conductor 34 of the cord 2 placed on the tongue 32 is crimped by the claws 33. As a result, the fuse clip 27 is electrically connected with the live conductor 34 in a reliable manner.

Referring to Figure 7(b), the fuse clip 28 also has a pair of holding portions 28a and their free ends 28b are bent outwardly for easier loading and unloading of the fuse 30. Like the holding portions 27a, the holding portions 28a of the fuse clip 28 are rounded to correspond to the configuration of the fuse 30. The holding portions 28a are connected by a connection portion 28c, and the connection portion 28c has an extension 35

The extension 35 has a flange portion 36. As illustrated in Figure 6, when the holding portions 28a of the clip 28 completely engage with the respective slit openings 29 and the connection portion 28c of the clip 28 contacts the back surface of the fuse box 8, the flange portion 36 of the extension 35 seats on the mount 21 and an opening 37 of the flange portion 36 engages with the terminal 5a of the live pin 5. After the fuse clip 28 is installed, the terminal 5a of the live pin 5 is riveted onto the flange portion 36 of the fuse clip 28. Therefore, the live pin 5 and the fuse clip 28 are now electrically connected with each other. It should be noted that

the terminal 5a may be welded or fused to the flange 36.

Referring to Figures 7(a), 7(b) and 7(c), each of the fuse clips 27 and 28 has projections 38 on the holding portions 27a or 28a. The projections 38 hook on the periphery of the respective openings 29 of the fuse box 8 inside the fuse box 8 as the fuse clip is completely attached to the fuse box 8.

Referring to Figure 2, a main body of the fuse 30 is made of ceramics, and the fuse 30 is clamped at its main body by a clamping portion 40 of a fuse carrier 39 before the fuse 30 is placed in the fuse box 8. When the fuse 30 is placed into the fuse box 8, the fuse carrier 39 (or the fuse 30) is turned upside down (the fuse 30 directly faces the fuse box 8 in this situation) and loaded into a fuse box entrance 26, as indicated by the single-dash line. The fuse carrier 39 and the clamping claw 40 are adapted such that opposite ends of the fuse 30 are properly engaged in the holding portions 27a and 28a of the clips 27 and 28 when installation of the fuse carrier 39 and the fuse 30 into the fuse box 8 is completed.

It should be understood that an ultraviolet curing resin (in liquid state) such as polyester-acrylate, epoxy-acrylate and polyurethane-acrylate may be dropped onto the connection between the terminal 6a of the neutral pin 6 and the ring terminal 25 and the ultraviolet ray may be irradiated onto the liquid resin to insulate the terminals 6a and 25. To accurately and smoothly join the plug base 3 with the cover 4, the plug base 3 may have a pair of ring members 41 near the fuse box 8 on its inner surface and four through bores 42 near its

periphery on the bushing receptacle 11 side and the opposite side, as illustrated in Figures 1 and 5. In this case, the cover 4 may integrally have a pair of complementary guide pins 43 which engage with the ring members 41 respectively and four complementary claws 44 which engage with the bores 42 respectively, as illustrated in Figure 8.

Each guide pin 43 has a length to allow itself to start engaging with the mating ring member 41 before the periphery 45 of the cover 4 is joined with the plug base 3 by means of the faucet joint. When the cover 4 and the plug base 3 are completely joined by their own faucet joint, the guide pins 43 are completely fit in the respective ring members 41.

Each hook member 44 has a free end 48 including a wedge-shaped guide face 46 and a stop face 47, as shown in Figure 8. To join the cover 4 with the plug base 3, the free end 48 of each hook member 44 is squeezed into the corresponding opening 42 of the plug base 3 and projects through the opening 42. Then, the stop face 47 hooks or claws the plug base 3 on the exterior surface of the plug base 3. Each hook member 44 has a length to realize tight joint between the cover 4 and the plug base 3 when the cover 4 and the plug base 3 are united by means of the faucet joint.

The cover 4 has a pair of protrusions 49 on its interior surface, as shown in Figure 8. These protrusions 49 have dimensions to abut and press the bridge portions 27c and 28c of the clips 27 and 28 when the periphery of the cover 4 engages with the peripheral groove 9 of the plug base 3 (faucet joint) (Figure 1). Accordingly, the clips 27 and 28 are pressed against

the fuse box 8.

As understood from the above, simply inserting the guide pins 43 of the cover 4 into the ring members 41 and slightly pressing the cover 4 against the plug base 3 results in initial engagement between the locking members 44 and the openings 42, and further pressing the cover 4 against the plug base 3 till the periphery 45 of the cover 4 engages with the groove 9 of the plug base 3 results in tight engagement between the locking members 44 and the openings 42. In this manner, the connection between the cover 4 and the plug base 3 is easily and accurately performed. Upon connection, the fuse clips 27 and 28 are substantially integrated with the plug base 3 and the cover 4 by the protrusions 49. Therefore, the fuse clips 27 and 28 are maintained in place even if they are subjected to vibrations. Vibrations occur when the plug is inserted into and pulled out of a socket. The fuse clips 27 and 28 tended to move if they were not held by the protrusions 49.

The cover 4 has a half cylindrical member 50 extending outwardly from the periphery 45, as shown in Figure 8. This member 50 cooperates with the other half cylindrical member (bushing receptacle) 11 of the plug base 3 to conceal and protect a front reduced portion 2b of the cord bushing 10 when the cover 4 is united with the plug base 3, as shown in Figure 6.

Upon completion of electrical connection between the plug base 3 and various elements and physical engagement between the plug base 3 and the cover 4, ultrasonic welding or the like is performed to the entire physical connection between the plug

base 3 and the cover 4. It should be noted that the welding may be performed to part of the physical connection if sufficient. The physical connection between the cover 4 and the plug base 3 includes the engaging portion between the periphery 45 of the cover 4 and the groove 9 of the plug base 3 and the abutting portion between the half cylindrical member 50 of the cover 4 and the bushing receptacle 11 of the plug base 3. This welding completes the assembling of the electric plug 1.

The electric plug 1 will undergo various electric tests after the fuse 30 is loaded into the fuse box 8.

As appreciated from the foregoing, the electric plug 1 according to the present invention has a greatly reduced number of rivetings. For example, no riveting is required when the welding is employed. This remarkably reduces a manufacturing cost of the plug 1 and improves reliability on electrical connection.

Figure 9(a) illustrates a modification of the fuse clip 28. Specifically, the extension 35 of the fuse clip 28 has a rounded portion 51 at its free end. This rounded portion 51 loosely fits over the terminal 5a of the live pin 5 and is tightly crimped thereafter using a suitable device. The crimping electrically connects the fuse clip 28 with the terminal 5a. The portion 51 may be curled by a known tool or machine.

Figure 9(b) illustrates a modified terminal 52 which is used as extended terminals of the neutral conductor 23 and the earth conductor 19. The terminal 52 may be crimped over the terminal 6a of the neutral pin 6 or/and the terminal 7a of the earth pin 7.

The terminal 52 is generally shaped to "L" and has two pair of claws 33 at opposite ends. One pair of claws 33 clinches the conductor 23 or 19 and the other pair clinches the terminal 6a of the neutral pin 6 or the terminal 7a of the earth pin 7a. These pairs of claws 33 are crimped by a suitable tool respectively to electrically connect the conductor 23 or 19 with the terminal 6a or 7a.

If the fuse clip 28 having the rounded portion 51 is employed to connect the fuse clip 28 with the terminal 5a of the live pin 5 and the L-shaped terminals 52 are employed to connect the neutral conductor 23 with the neutral pin 6 and to connect the earth conductor 19 with the grounding pin 7, no riveting is required. This brings about great improvement in manufacturing cost of the plug 1 and reliability on electrical connection.

In the illustrated embodiment, the guide pins 43 and the locking members 44 extend from the cover 4 and the ring members 41 and the openings 42 are formed on and in the plug base 3. However, it should be noted that the guide pins 43 and the locking members 44 may extend from the plug base 3 and the ring members 41 and the openings 42 may be provided on and in the cover 4.

Another electric plug according to the present invention will be described with reference to Figures 11 to 15.

The same or similar elements and parts of the electric plugs in the foregoing and this embodiments have the same or similar reference numerals and explanation of these elements will be omitted here.

In Figures 11 to 15, 1-1 designates an electric plug, 2-1 a two-core cord (this cord is flat in section), 3 a plug base, 4 a cover, 5 a live pin, 5a a terminal of the live pin 5, 6 a neutral pin, 6a a terminal of the neutral pin 6, 7 an earth pin, 7a a terminal of the earth pin 7, 8 a fuse box, 23 a neutral conductor, 25 a ring terminal of the neutral conductor 23, 27 and 28 fuse clips, 29 an opening of the fuse box 8, and 34 a live conductor.

One of major features of the plug 1-1 as compared with the foregoing embodiment lies in that the cord 2-1 is a two-core ring cord which does not have the earth conductor 19, as shown in Figure 11. Another feature, which concerns the plug base 3, is that the terminal 7a of the earth pin 7 is completely embedded and concealed inside a projection 50 formed on an inner surface of the plug base 3, as shown in Figures 11 to 13. This prevents the earth terminal 7a from being connected with the live or neutral pin and from being grounded.

Further, no groove is formed along the periphery of the plug base 3 (groove 9 is formed in the first embodiment; Figure 1). Instead, as shown in Figure 14, a step portion 9-1 is formed in an inner periphery of the cover 4. The step portion 9-1 is used to join the cover 4 with the plug base 3 by means of faucet joint.

Referring back to Figure 11, a pair of guide pedestals 43-1 stands beside the bushing receptacle 11 on the plug base 3. The cover 4 has a pair of complementary members 43-2 near the half cylindrical member 50 inside itself, as illustrated in Figure 14. When the cover 4 is placed over the plug base 3, the

pedestals 43-1 engage with the quarter cylindrical members 43-2 respectively.

The above-described structure simplifies the configuration of the electric plug and reduces the weight and manufacturing cost of the same. As depicted in Figures 11 to 14, the electric plug 1-1 of this embodiment does not have positioning grooves 17 and 24, locking members 44, openings 42, guide pins 43 and openings 41.

Installation of fuse clips 27 and 28 (Figures 7(a) to 7(c)) into openings 29 of a fuse box 8, electrical connection of neutral conductor 23 and live conductor 34, and welding between the plug base 3 and the cover 4 may be conducted in the same manner as the previous embodiment. Regarding the electrical connection, therefore, the same reliability as the first embodiment can be expected.

CLAIMS

1. An electric plug to be connected with a cord having a live conductor, a neutral conductor and an earth conductor, comprising:

a plate-like plug base integrally having a live pin, a neutral pin and an earth pin, the live, neutral and earth pins standing on an outside surface of the plug base respectively and having terminals projecting from an inside surface of the plug base respectively;

a fuse box integrally molded to the inside surface of the plug base, the fuse box having a first pair of slit-like openings in its bottom for receiving a pair of holding portions of a first fuse clip and a second pair of slit-like openings in its bottom for receiving a pair of holding portions of a second fuse clip, the first and second fuse clips being attached onto the bottom of the fuse box from the inside surface side of the plug base respectively, the first fuse clip having a portion for crimping the live conductor of the cord, the second fuse clip having an extension, the extension having an opening for engagement with the terminal of the live pin, the neutral conductor having a ring terminal which is riveted onto the terminal of the neutral pin, the earth pin having a ring terminal which is riveted on the terminal of the earth pin, the extension of the second fuse clip being riveted onto the terminal of the live pin; and

a cover engageable with the plug base along

respective peripheries for enclosing an inside of the plug base, the covering being at least partially fused to the plug base.

2. The electric plug of claim 1, wherein the cover has a pair of projections on its inner surface to press the first and second fuse clips respectively against the bottom of the fuse box when the cover engages with the plug base, each fuse clip being pressed at a portion connecting the holding portions.

3. The electric plug of claim 1 or 2, wherein the cord has a bushing made from a flexible insulating resin at its free end, and the cord is firmly connected to the plug base via the bushing.

4. The electric plug of claim 1, 2 or 3, wherein the plug base has a partition wall for electrically separating the extension of the second fuse clip from the conductors of the cord.

5. The electric plug of any preceding claim, wherein the plug base has a groove along its inner periphery so that the cover and the plug base engage with each other by means of faucet joint.

6. An electric plug to be connected with a cord having a live conductor, a neutral conductor and an earth conductor, comprising:

a plate-like plug base integrally having a live pin, a neutral pin and an earth pin, all the pins standing on an outside surface of the plug base and having terminals projecting from an inside surface of the plug base;

a fuse box integrally molded to the inside surface of the plug base, the fuse box having a first pair of slit-like openings in its bottom for receiving a pair of holding portions of a first fuse clip and a second pair of slit-like openings in its bottom for receiving a pair of holding portions of a second fuse clip, the first and second fuse clips being attached onto the bottom of the fuse box from the inside surface side of the plug base respectively, the first fuse clip having a portion for crimping the live conductor of the cord, the second fuse clip having an extension to be crimped or welded onto the terminal of the live pin, the neutral conductor being crimped or welded onto the terminal of the neutral pin, the earth pin being crimped or welded onto the terminal of the earth pin; and

a cover engageable with the plug base along respective peripheries for enclosing an inside of the plug base, the covering being at least partially fused to the plug base.

7. The electric plug of claim 6, wherein the cover has a pair of projections on its inner surface to press the first and second fuse clips respectively against the bottom of the fuse box when the cover engages with the plug base, each fuse clip being pressed at a portion connecting the holding portions.

8. The electric plug of claim 6 or 7, wherein the cord has a bushing made from a flexible insulating resin at its free end, and the cord is firmly connected to the plug base via the bushing.

9. The electric plug of claim 6, 7 or 8, wherein the plug base has a partition wall for electrically separating the extension of the second fuse clip from the conductors of the cord.

10. The electric plug of any of claims 6 to 9, wherein the plug base has a groove along its inner periphery so that the cover and the plug base engage with each other by means of faucet joint.

11. An electric plug to be connected with a cord having a live conductor and a neutral conductor, comprising:

a plate-like plug base integrally having a live pin, a neutral pin and an earth pin, the live, neutral and earth pins standing on an outside surface of the plug base respectively and the live and neutral pins having terminals projecting from an inside surface of the plug base respectively;

a fuse box integrally molded to the inside surface of the plug base, the fuse box having a first pair of slit-like openings in its bottom for receiving a pair of holding portions of a first fuse clip and a second pair of slit-like openings in its bottom for receiving a pair of holding portions of a second fuse clip, the first and second fuse clips being attached onto the bottom of the fuse box from the inside surface side of the plug base respectively, the first fuse clip having a portion for crimping the live conductor of the cord, the second fuse clip having an extension, the extension having an opening for engagement with the terminal of the live pin, the neutral conductor having a ring terminal which is riveted onto the terminal of the neutral pin, the extension of the second fuse clip being riveted onto the terminal of the live pin; and

a cover engageable with the plug base along respective peripheries for enclosing an inside of the plug base, the covering being at least partially fused to the plug base.

12. The electric plug of claim 11, wherein the cover has a pair of projections on its inner surface to press the first and second fuse clips respectively against the bottom of the fuse box when the cover engages with the plug base, each fuse clip being pressed at a portion connecting the holding portions.

13. The electric plug of claim 11, wherein the cord has a bushing made from a flexible insulating resin at its free end, and the cord is firmly connected to the plug base via the bushing.

14. The electric plug of claim 11 or 12, wherein the cover has a groove along its inner periphery so that the cover and the plug base engage with each other by means of faucet joint.

15. An electric plug to be connected with a cord having a live conductor and a neutral conductor, comprising:

a plate-like plug base integrally having a live pin, a neutral pin and an earth pin, all the pins standing on an outside surface of the plug base and the live and neutral pins having terminals projecting from an inside surface of the plug base;

a fuse box integrally molded to the inside surface of the plug base, the fuse box having a first pair of slit-like openings in its bottom for receiving a pair of holding portions of a first fuse clip and a second pair of slit-like openings in its bottom for receiving a pair of holding portions of a second fuse clip, the first and second fuse clips being attached onto the bottom of the fuse box from the inside surface side of the plug base respectively, the first fuse clip having a portion for crimping the live conductor of the cord, the second fuse clip having an extension to be crimped or welded onto the terminal of the live pin, the neutral conductor being crimped or welded onto the terminal of the neutral pin; and

a cover engageable with the plug base along respective peripheries for enclosing an inside of the plug base, the covering being at least partially fused to the plug base.

16. The electric plug of claim 15, wherein the cover has a pair of projections on its inner surface to press the first and second fuse clips respectively against the bottom of the fuse box when the cover engages with the plug base, each fuse clip being pressed at a portion connecting the holding portions.

17. The electric plug of claim 15 or 16, wherein the cord has a bushing made from a flexible insulating resin at its free end, and the cord is firmly connected to the plug base via the bushing.

18. The electric plug of claim 15, 16 or 17, wherein the cover has a groove along its inner periphery so that the cover and the plug base engage with each other by means of faucet joint.

19. An electric plug to be connected with a cable having a live conductor and a neutral conductor, comprising:

a plug base;

a live pin and a neutral pin projecting on the
5 outside surface of the plug base, each pin having a connection terminal accessible from the inside surface of the plug base;

a fuse box integrally formed in the plug base for receiving a fuse from the outside surface of the plug
10 base;

fuse connection means for electrically connecting a fuse placed within the fuse box with first and second connection terminals accessible from the inside surface of the plug base, the first connection terminal being
15 electrically connected to the connection terminal of the live pin; and

a plug cover engageable with the plug base, the engagement between the plug cover and the plug base being such as to allow the plug to be sealed so as to render
20 it non-rewirable by a user; wherein:

the connection between the live pin connection terminal and the first connection terminal of the fuse connection means is formed by a non-riveting method, or at least one of the neutral pin connection terminal and
25 the second connection terminal of the fuse connecting means is adapted to receive a conductor by a non-riveting method.

20. A plug base for use in a plug according to claim 19, comprising:

a live pin and a neutral pin projecting on the outside surface of the plug base, each pin having a connection terminal accessible from the inside surface of the plug base;

a fuse box integrally formed in the plug base for receiving a fuse from the outside surface of the plug base; and

10 fuse connection means for electrically connecting a fuse placed within the fuse box with first and second connection terminals accessible from the inside surface of the plug base, the first connection terminal being electrically connected to the connection terminal of the live pin; wherein:

15 the connection between the live pin connection terminal and the first connection terminal of the fuse connection means is formed by a non-riveting method, or at least one of the neutral pin connection terminal and the second connection terminal of the fuse connecting means is adapted to receive a conductor by a non-riveting method.

21. An electric plug to be connected with a cable having a live conductor, a neutral conductor and an earth conductor, comprising:

a plug base;

a live pin, a neutral pin and an earth pin projecting on the outside surface of the plug base, each pin having a connection terminal accessible from the inside surface of the plug base;

- 5 a fuse box integrally formed in the plug base for receiving a fuse from the outside surface of the plug base;

10 fuse connection means for electrically connecting a fuse placed within the fuse box with first and second connection terminals accessible from the inside surface of the plug base, the first connection terminal being electrically connected to the connection terminal of the live pin; and

15 a plug cover engageable with the plug base, the engagement between the plug cover and the plug base being such as to allow the plug to be sealed so as to render it non-rewirable by a user; wherein:

the connection between the live pin terminal and the first connection terminal of the fuse connection means is formed by a non-riveting method, or at least one of the neutral pin connection terminal, the earth pin connection terminal and the second connection terminal of the fuse connecting means is adapted to receive a conductor by a non-riveting method.

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22. A plug base for use in a plug according to claim 21, comprising:

a live pin, a neutral pin and an earth pin projecting on the outside surface of the plug base, each pin having a connection terminal accessible from the inside surface of the plug base;

5 a fuse box integrally formed in the plug base for receiving a fuse from the outside surface of the plug base; and

10 fuse connection means for electrically connecting a fuse placed within the fuse box with first and second connection terminals accessible from the inside surface of the plug base, the first connection terminal being electrically connected to the connection terminal of the live pin; wherein:

15 the connection between the live pin terminal and the first connection terminal of the fuse connection means is formed by a non-riveting method, or at least one of the neutral pin connection terminal, the earth pin connection terminal and the second connection terminal of the fuse connecting means is adapted to receive a
20 conductor by a non-riveting method.

23. A plug or plug base according to any of claims 19 to 22, wherein said non-riveting technique is one of crimping, welding and fusing.

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24. A plug substantially as described hereinbefore with reference to, or as shown in, the accompanying drawings.

25. A plug base substantially as described hereinbefore with reference to, or as shown in, the accompanying drawings.

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(GCW, GEP)

(ii) Int Cl (Ed.6) H01R, H01H

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28 NOVEMBER 1994**Databases (see below)**

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant
following a search in respect of
Claims :-
1 TO 25**Categories of documents**

- X:** Document indicating lack of novelty or of inventive step. **P:** Document published on or after the declared priority date but before the filing date of the present application.
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- A:** Document indicating technological background and/or state of the art. **&:** Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
Y	GB 2152301 A	(IRISH DRIVER-HARRIS)	20, 22
Y	GB 2092836 A	(LUCAS)	1, 2, 6, 7, 11, 12, 19 to 23
Y	GB 2043031 A	(BICC) Figure 3 appears to disclose lugs in a cap for maintaining contacts in position	1, 2, 6, 7, 11, 12, 19 to 23
Y	GB 2004707 A	(NETTLE)	1, 2, 6, 7, 11, 12, 19 to 23
X, Y	GB 2003676 A	(NETTLE)	X: 1, 2, 11, 12 Y: 6, 7, 15, 16, 19 to 23
X, Y	GB 1604426	(BICC) Figures 5, 6, 7	X: 20, 22, 23 Y: 6, 7, 15, 16, 19, 21

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Category	Identity of document and relevant passages	Relevant to claim(s)
Y	GB 1595782 (LUCAS)	1, 2, 6, 7, 11, 12, 19 to 23
Y	GB 1581663 (WARD & GOLDSTONE)	1, 2, 6, 7, 11, 12 19 to 23
Y	EP 0016269 A1 (BICC)	1, 2, 6, 7, 11, 12, 19 to 23